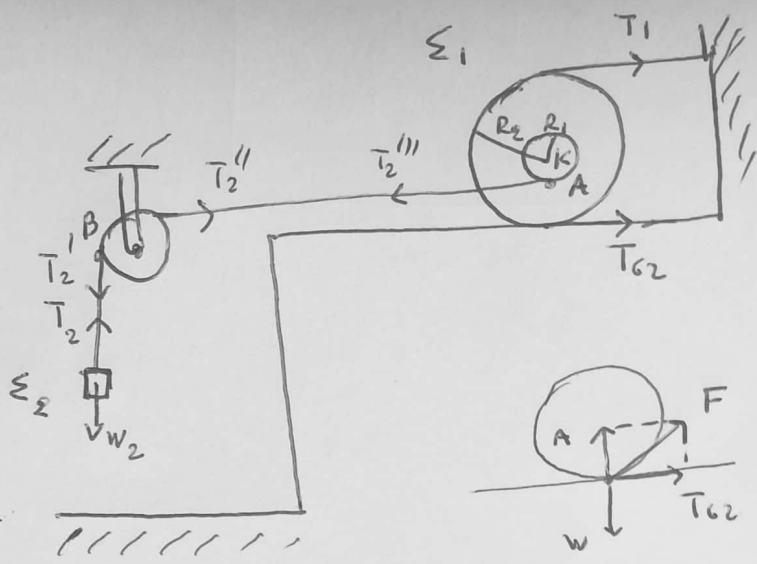
ΘΕΜΑ 4ο



Λόγω Ισορροπίας

$T_2 = T_2' = T_2'' = T_2'''$

Ισορροπία Σ_2: $T_2 = W_2 = 20\,N$

Ισορροπία Σ_1: $T_2 = T_1 + T_{62} \Rightarrow$

$20 = T_1 + T_{62}$ (1)

και $\Sigma\tau_{(K)} = 0 \Rightarrow$

$T_1 R_2 + T_2 \cdot R_1 = T_{62} \cdot R_2 \Rightarrow T_1 R/2 + T_2 \frac{R_2}{4} = T_{62} R/2 \Rightarrow$

$\Rightarrow T_1 + 5 = T_{62}$ (2) (1)(2) $\Rightarrow$ $T_{62} = 12,5\,N$ και $T_1 = 7,5\,N$

β) $h = \frac{1}{2} \alpha t_1^2 \Rightarrow 6 = \frac{1}{2} 3 t_1^2 \Rightarrow t_1 = 2s$

$\omega = \alpha_\gamma \cdot t_1 \Rightarrow \omega = 10 \cdot 2 = 20\ rad/s$

γ) $L = m \cdot U_2 \cdot r$ (A) $U_2 = a_{cm} t_1 = 3 \cdot 2 = 6\,m/s$. $m = 2\,kg$.

$U_A = U_B \Rightarrow \omega_{cm} - \omega R_1 = U_B \Rightarrow \alpha_{cm} - R_1 \alpha_\gamma = \alpha \Rightarrow$

$\Rightarrow \alpha_\gamma R_2 - \alpha_\gamma R_1 = \alpha \Rightarrow \alpha_\gamma R_2 - \alpha_\gamma \frac{R_2}{4} = \alpha \Rightarrow \boxed{R_2 = 0,4\,m}$

και $\boxed{R_1 = 0,1\,m} = r$

(A) $\Rightarrow L = 2 \cdot 6 \cdot 0,1 = 1,2 \cdot kg \frac{m^2}{s}$

δ) $S_2 = \frac{1}{2} a_{cm} t_1^2 \Rightarrow S_2 = \frac{1}{2} \cdot \alpha_\gamma \cdot R_2 t_1^2 \Rightarrow S_2 = 8\,m$

Κάθε χειρ σημείο: $S_2 = R_2 \Delta\theta \Rightarrow \Delta\theta = \frac{S_2}{R_2} = 20\ rad$.

Άρα $S_1 = R \Delta\theta = 2\,m$.

ε) $F^2 = A^2 + T_{62}^2 \Rightarrow F^2 = W^2 + (\mu_{62} W)^2 \xrightarrow[A = W = Mg]{} \ldots \Rightarrow W = \frac{7}{4}\,kg$.

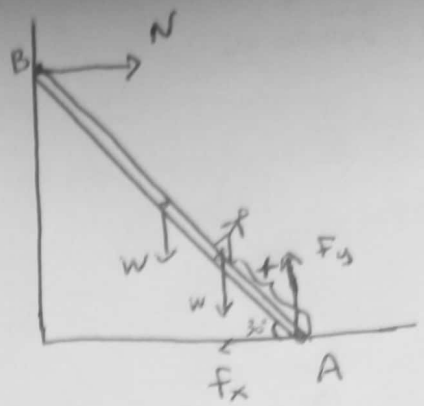
Β2. $\Sigma F_x = 0 \Rightarrow F_x = N \Rightarrow$

$\mu \cdot F_y = N$ (1)

$\Sigma F_y = 0 \Rightarrow W + W = F_y \Rightarrow F_y = 2W$ (2)

$\Sigma \tau_{(A)} = 0 \Rightarrow -L \cdot N \cdot \eta\mu 30° + W \frac{L}{2} \cdot \eta\mu 60° + W \cdot \eta\mu 60° \cdot x = 0$

$\Rightarrow \boxed{x = \frac{L}{4}}$



Σωστη (β)

ΘΕΜΑ 3ο α) $\Delta S_{\pi\eta} = R \cdot \Delta\theta = 0,5 \cdot 4\pi = 2\pi = 6,28m$.

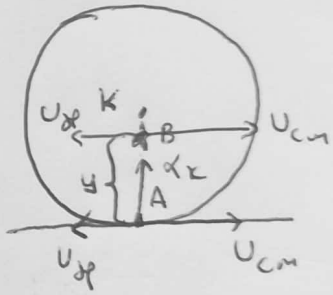
$\Delta x_{cm} = 8m$

Άρα εφόσον $\Delta S_{\pi\eta} \neq \Delta x_{cm}$ ο τροχός ολισθαίνει.

β) $U_A = U_{cm} - U_\sigma = U_{cm} - \omega \cdot R$ (1)

$\Delta x_{cm} = U_{cm} \cdot t_1 \Rightarrow t_1 = \frac{\Delta x_{cm}}{U_{cm}} = 2s$

$\omega = \frac{\Delta\theta}{t_1} \Rightarrow \omega = \frac{4\pi}{2} = 2\pi \ rad/s.$



(1) $\Rightarrow U_A = 4 - 2\pi \cdot 0,5 = 0,86 \frac{m}{s}$

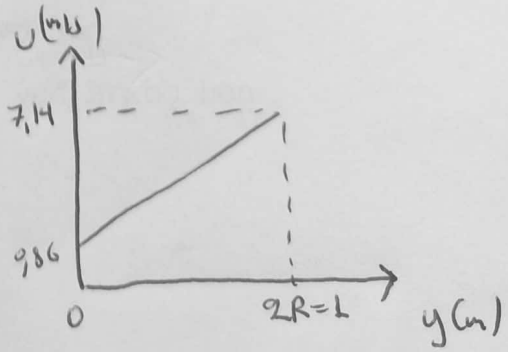
$\alpha_A = \alpha_K = \frac{U_A^2}{R} = \frac{0,86^2}{0,5} \ m/s^2$

γ) $U_B = U_{cm} - U_\sigma = U_{cm} - \omega(R - y) = 4 - 2\pi(0,5 - y)$

$= (4 - \pi) + 2\pi y$

Για $y = 0 \quad U_B = 0,86 \ m/s$

Για $y = 2R \quad U_B = 4 + \pi = 7,14 \ m/s$



Απαντήσεις – Διαγώνισμα

Σεπτέμβριος 31-10-2022

Θέμα 1ο $1 \to \beta \quad 2 \to \delta \quad 3 \to \delta \quad 4 \to \delta$

5. Λ Λ Λ Λ Σ

Θέμα 2ο

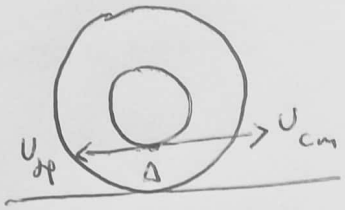
BL $v_\Sigma = v_\Delta = v_{cm} - v_H$

$v_\Sigma = \omega R - \omega r \Rightarrow$

$\frac{\Delta v_\Sigma}{\Delta t} = \frac{\Delta(\omega R - \omega r)}{\Delta t} \Rightarrow$

$\alpha_\Sigma = R \cdot \frac{\Delta \omega}{\Delta t} - r \cdot \frac{\Delta \omega}{\Delta t} \Rightarrow$

$\alpha_\Sigma = R\alpha_\gamma - r\alpha_\gamma \quad (1)$



$\Delta x_{cm} = \frac{1}{2} \alpha_{cm} t^2 \quad (2)$

$\Delta x_\Sigma = \frac{1}{2} \alpha_\Sigma t^2 \overset{(1)}{=} \frac{1}{2} (\alpha_\gamma R - \alpha_\gamma r) t^2 = \frac{1}{2} (\alpha_{cm} - \frac{\alpha_{cm}}{R} r) t^2 \Rightarrow$

$\Delta x_\Sigma = \frac{1}{2} \alpha_{cm} t^2 - \frac{1}{2} \alpha_{cm} \frac{r}{R} t^2 \overset{(2)}{\Rightarrow}$

$\Delta x_\Sigma = \Delta x_{cm} - \Delta x_{cm} \frac{r}{R} \Rightarrow \boxed{\Delta x_\Sigma = \Delta x_{cm} \left(1 - \frac{r}{R}\right)}$

$B_1 \to (\alpha.)$